APPENDIX H

QUALITY ASSURANCE/QUALITY CONTROL
EVALUATION RESULTS

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QUALITY ASSURANCE/QUALITY CONTROL EVALUATION RESULTS

H.1. ENVIRONMENTAL DATA

H.1.1 ANALYTICAL METHODS

During the analytical program for the Depleted Uranium Hexafluoride (DUF6) Conversion Facility Environmental and Geotechnical Site Characterization Study at the Portsmouth Diffusion Plant (PORTS), the following laboratories were used:

- Recra Environmental Inc., Lionville, PA, was the fixed-base laboratory for all environmental soil and groundwater samples.

- International Technology Corporation (IT), Oak Ridge, TN, was the fixed-base laboratory for geotechnical samples.

Chemicals of potential concern for the DUF6 site were selected based on historical and future use of the site. There have been no previous samplings at the site. The site characterization included collecting geotechnical, chemical, and radiological properties of the underlying soils and groundwater; determining hydrogeological characteristics of the site; identifying utility availability and capacity; and identifying site topography and definition. Environmental sampling included analyses of volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), alpha spectroscopy, gamma spectroscopy, and beta liquid scintillation counting (LSC).

Recra Environmental Inc., performed fixed-base laboratory analyses of soil and water samples. This laboratory was contracted through the U.S. Department of Energy (DOE) Oak Ridge Operations (ORO) Sample Management Office (SMO) and is a DOE-approved, Nuclear Regulatory Commission-licensed laboratory. U.S. Environmental Protection Agency (EPA) SW-846 methods were used for all samples, except those parameters for which other methods are necessary. The analysis followed SW-846 protocols and "Forms Only" data packages were provided along with electronic data deliverables (EDDs). Table H.1 summarizes the analytical methods and sample requirements of the fixed-base laboratory. Fixed-base laboratory data qualifiers are defined here:

Organic Analysis

U   Indicates the compound was analyzed for but not detected.

J   Indicates an estimated value. This flag is used under the following circumstances: (1) when estimating a concentration for tentatively identified compounds (TICs) where a 1:1 response is assumed and (2) when the mass spectral and retention time data indicate the presence of a compound that meets the pesticide/Aroclor identification criteria, and the result is less than the contract-required quantitation limit but greater than zero.

P   This flag is used for pesticide/Aroclor target analyte when there is greater than 25% difference for detected concentrations between the two gas chromatography (GC) columns.

C   This flag applies to pesticide results where the identification has been confirmed by GC/mass spectrometry (MS).

B   This flag is used when the compound is found in the associated blank as well as in the sample.

E   This flag identifies compounds whose concentrations exceed the calibration range of the GC/MC instrument for that specific analysis.

D   This flag identifies all compounds identified in an analysis at a secondary dilution factor.

I   Interference

NQ Result qualitatively confirmed but not able to quantify.

N   Indicates presumptive evidence of a compound. This flag is only for TICs.

X   This flag is used for a TIC compound which is quantified relative to a response factor generated from a daily calibration standard rather than quantified relative to the closest internal standard.

Y   Other specific flags may be required to properly define the results.

Table H.1. Analytical methods, preservation, and container type for all samples analyzed by fixed-base laboratory

Analysis	Analytical method	Container type	Preservation
Soil			
TCL VOAs	SW-846 8260B	4-oz. glass	Cool to 4°C
TCL SVOAs	SW-846 8270C	8-oz. amber glass	Cool to 4°C
PCBs	SW-846 8082 SW-846 3520 SW-846 3540	8-oz. amber glass	Cool to 4°C
Radionuclides	Alpha spectroscopy Beta LSC Gamma spectroscopy	16-oz. widemouth plastic jar	Not applicable
Gross Alpha/ Gross Beta	Portsmouth method: SP4-TF-RL 7240	16-oz. widemouth plastic jar	Not applicable
Groundwater			
TCL VOCs	SW-846 8260B	(2) 40-mL amber glass	HCl, pH<2; cool to 4°C
TCL SVOCs	SW-846 8270C	1-L amber glass	Cool to 4°C
PCBs	SW-846 8082 SW-846 3520 SW-846 3540	1-L amber glass	Cool to 4°C

H.1.2 ANALYTICAL DATA QUALITY

H.1.2.1 Precision, Accuracy, Representativeness, Completeness, and Comparability

Precision, accuracy, and completeness objectives for the fixed-base laboratory measurements during the DUF6 Conversion Facility Site Characterization are presented in Bechtel Jacobs Company LLC's (BJC's) Analytical Services Master Specifications. An assessment of the precision, accuracy, representativeness, completeness, and comparability of fixed-base laboratory analytical data was performed and the results are discussed in the following paragraphs.

H.1.2.1.1 Precision

Precision is a measure of the agreement or repeatability of a set of replicate results (relative percent difference [RPD]) obtained from duplicate laboratory analyses of one property using the same method or technique. Precision for analytical data collected during the sampling event was evaluated using results of field duplicate samples, laboratory duplicate samples, matrix spike and matrix spike duplicate (MS/MSD) samples, and/or consecutive laboratory control samples (LCSs). The RPD is calculated and compared to the appropriate quality assurance (QA) objective. RPDs, which are typically expressed as percentages, are used to evaluate both field and laboratory duplicate precision and are calculated as follows:

$$RPD = \frac{|V1 - V2|}{(V1 + V2)/2} \times 100$$

where

$\quad$ RPD $\quad$ = $\;$ relative percent difference,
$\quad$ V1, V2 = $\;$ two results obtained by analyzing duplicate samples.

For the DUF6 conversion facilities site characterization, field duplicate samples were collected for all media at a frequency of 5 percent. Exceedances of the acceptable RPD for MS/MSD ($\pm$ 20 % for aqueous samples, $\pm$ 35% for soil samples) were noted for Aroclor-1254 in water and for pyridine, 1,4 dichlorobenzene, and hexachloroethene in soil.

H.1.2.1.2 Accuracy

Accuracy is a measure of the agreement between the true value and the value measured using an analytical method (percent recovery). Accuracy also is evaluated during data validation by assessing initial and continuing calibration data for the analytical instrument. Accuracy for analytical data collected during the DUF6 Site Characterization was assessed by evaluating percentage recoveries for MS/MSD samples, surrogate spikes, and blank spikes.

The recovery of each spiked analyte is calculated and compared to the appropriate QA objective, between 75% and 125%. The percent recovery (%R) for MS/MSD analysis did not meet the objective for 2,4-dichlorophenol, 2,4-dinitrotoluene, and 4-nitrophenol in water. The surrogate %R did not meet the objective for tetrachloro-m-xylene and decachlorobiphenyl in water. The %R for the LCS analysis did not meet the objective for pentachlorophenol in soil samples UF00-SB11 and UF00-SB12 and Aroclor-1254 in water. No detected concentrations were rejected for this reason. The continuing calibration did not meet QA objectives for Aroclor-1260.

H.1.2.1.3 Representativeness

Representativeness is the degree to which the data obtained from an environmental sample accurately reflect the nature and extent of contamination at a site. The data collected during the DUF6 Site Characterization were both accurate and precise. The samples required in the DUF6 Site Characterization were collected using standardized procedures designed to provide a true representation of the location sampled. Standardized, accepted analytical methods or modified standard methods, using National Institute of Standards and Technology traceable standards, were used to ensure that accurate, reproducible data were generated. Based on these criteria, the data from the DUF6 Site Characterization were deemed representative.

H.1.2.1.4 Completeness

Completeness is the percentage of useable data reported and validated compared with the total number of data expected. "Overall completeness" refers to the percentage of valid measurements versus the total measurements planned where "laboratory completeness" refers to the percentage of useable data reported by the laboratory versus the total number of data samples collected. Useable data are those measurements that were not rejected (qualified with an "R") during the validation process. The fractions and media analyzed and their corresponding data completeness as determined by the validation process were: all volatile data – 100%, semivolatile data from borings UF00-SB11, UF00-SB12, and rinsate blank UF00-RB04 – 100%, gross alpha and gross beta data from UF00-SB7, UF00-SB8, and UF00-SB12 – 100%, and all PCB data – 100%. The goal for analytical completeness for the DUF6 site characterization was 90 percent useable data. The completeness goal of 90 percent was met for all matrices and all parameters.

- All volatile data – 100%
- Semivolatile data from borings UF00-SB11, UF00-SB12, and rinsate blank UF00-RB04 – 100%
- Gross alpha and gross beta data from UF00-SB7, UF00-SB8, and UF00-SB12 – 100%
- All PCB data – 100%

The goal for analytical completeness for the DUF6 Site Characterization was 90% usable data. The completeness goal of 90% was met for all matrices and all parameters.

H.1.2.1.5 Comparability

Comparability is defined as the degree of confidence with which one data set can be compared to another. Data collected for this investigation were generally collected according to the DUF6 Work Plan and the Quality Assurance Project Plan (QAPP), and all field changes were approved. The overall comparability of the data collected in the DUF6 Site Characterization to historical data is good.

H.1.2.2 Surveillances

Tetra Tech, Inc., conducted surveillances of the field activities. Surveillances covered the following: sample management activities, log keeping and chain-of-custody documentation, equipment decontamination, waste management activities, sampling activities, implementation of QA data policies, and boring abandonment activities. The ORO-SMO conducted laboratory surveillances of the fixed-base laboratory.

H.1.2.3 Data Quality Objectives

Data Quality Objectives (DQOs) are qualitative and quantitative criteria used to establish requirements for sample collection and analysis and are based on the intended uses of the data. The overall intent of the DQOs is to generate data of appropriate quality to support the characterization of the site for use as an uranium conversion facility. DQOs were documented in the approved DUF6 Work Plan and were implemented as documented in the Sampling and Analysis Plan (SAP) and the QAPP.

H.1.2.4 Fixed-Base Laboratory Performance

Fixed-base laboratory performance was based on the results of the laboratory quality control (QC) samples, MS/MSD analysis, and adherence to the laboratory procedures through data validation. The laboratory is audited annually by ORO-SMO and is contracted to follow the Analytical Master Specification document for various analytical chemistry protocols mandated by ORO-SMO.

Some continuing calibration deficiencies led to laboratory qualification of some data during data validation. Specific laboratory problems with the data were addressed and resolved during the data assessment phase.

H.1.2.5 Data Validation

Data validation is a process performed for a data set by a qualified individual independent from sampling, laboratory, project management, and other decision-making personnel for the project. In the data validation process, the laboratory adherence to analytical method requirements is evaluated. Tetra Tech's subcontractor, NFT, Inc., with oversight provided by the BJC Sample Manager, validated definitive data collected for this DUF6 Site Characterization in accordance with TT-ERWM/ER-P2213, "Data Validation Plans for ER Projects," and the following BJC validation procedures:

- EMEF Intersite Procedure Environmental Restoration and Waste Management (ERWM)/Environmental Restoration (ER)-P2209, *Radiochemical Data Verification and Validation*, Rev. 0.
- EMEF Intersite Procedure ERMW/ER-P2210, *Volatile and Semivolatile Data Verification and Validation*, Rev. 0.
- EMEF Intersite Procedure ERMW/ER-P2211, *Pesticide and PCB Data Verification and Validation*, Rev. 0.
- EMEF Intersite Procedure ERMW/ER-P2212, *Inorganic Data Verification and Validation*, Rev. 0.

As part of the data review process, findings were qualified as necessary to reflect data validation results. The following qualifiers were assigned by the data validators:

U   The material was analyzed for, but was not detected. The associated numerical value is the quantitation limit.
J   Estimated value, either because QC criteria were not met or because the amount detected is below the documented quantitation limit.
UJ   Undetected but the number reported as the quantitation limit is an estimated value.
NJ   Presumptively present at an estimated quantity.
R   Rejected, so data are of "information only" quality and should be supplemented with additional data for decision making.

=   Data were validated; however, no qualifier was added.

X   Data were not validated.

Data generated by the fixed-base laboratory were independently validated on a frequency of 10 percent.

Data packages from the DUF6 conversion site were validated for parameters including VOAs, PCBs, SVOAs, and radiological analyses. A review of the data validation summary reports indicates that the majority of data quality parameters, including MS/MDS recovery and RPD criteria, for the validated data packages were within established method-specific limits. Of the overall analytical data, no data points were rejected.

H.1.3 DATA MANAGEMENT

Project Environmental Measurement System (PEMS) was used to manage field-generated data; import laboratory-generated data; and add data qualifiers based on data verification, validation, and assessment. PEMS included a tracking system to identify, track, and monitor each sample and associated data from point of collection through final data reporting. The system included field measurements, chain-of-custody information, and a tracking system for tracking hard-copy data packages and EDDs. PEMS also included information for field planning and data evaluation.

All data packages and EDDs received from the laboratory were tracked, reviewed, and maintained in a secure environment. When first received, data packages were assigned a document control number and then logged into the tracking system. The following information was tracked: sample delivery group numbers, date received, document control number, number of samples, sample analyses, receipt of EDDs, and comments.

The data verification processes for laboratory data were implemented for both hard-copy data and EDDs. The data packages were reviewed to confirm that all samples had been analyzed for the requested parameters. Discrepancies were reported to the laboratory and the data validators. As part of a series of internal integrity checks within PEMS, a check was run to identify which of the requested samples and analyses were not received in EDDs. Hard-copy data packages were checked to confirm agreement with the associated EDD. Integrity checks in PEMS were also used to check the list of compounds generated by the laboratory to confirm the data were provided for all requested analytes. Discrepancies were reported to the laboratory for responses and/or correction and to the data validators.

Data verification within PEMS included standardization of analytical methods, chemical names and units, as well as checks for holding time violations and detections above background values. Validation qualifiers from the NFT, Inc., data validators were manually input into PEMS. PEMS system requirements included backups, security, change control, and interfacing with other data management systems. PEMS was housed on the Paducah Environmental Management and Enrichment Facilities (EMEF) network. System backups were performed nightly following standard Paducah EMEF network protocol. Updates made to files were copied to a computer backup tape each night, and an entire backup was performed each week.

Security of PEMS and data used for the data management effort was considered essential to the success of the project. The security protocol followed by the data management team was consistent with

that of the Paducah EMEF network. Access to the network is password-protected. Access to PEMS was limited, on an as-needed basis, to the data management personnel. Read-write, graded access to PEMS was limited to the data management team, which consisted of the PEMS Coordinator and the supporting data entry staff. The data management staff assisted other project members with data needs from PEMS by running requested queries.

Each sampling location and sample collected during the DUF6 Site Characterization was assigned a discrete sample identification (ID) number, which consisted of the site identification, the sample borehole number, and the depth at which the sample was collected. According to the requirements of the PEMS database, sample nomenclature cannot exceed 12 characters in length. Table H.2 illustrates the sample nomenclature used at the DUF6 site.

Table H.2 DUF6 conversion facility sample number scheme

Sample category	Project ID No.	Sample ID No.
Soil boring	UF00-SB07 through SB12	UF00-SBXX[a]XXXX[b]
Quality Control		UF00-YY[c]ZZ[d]

[a]XX – boring number (i.e., 07 for boring No. 7)
[b]XXXX –sampling interval (i.e., 0510 for the sample collected from 5-10 ft)
[c]YY – designation for type of QC sample: FB = field blank, TB = trip blank, RB = rinsate blank.
[d]ZZ – sequential number

H.1.4 DATA ASSESSMENT/VALIDATION

To confirm the data set could be used by prospective bidders to complete their proposal/bid for designing, constructing, and operating the uranium conversion facility, the Site Characterization team performed various checks and reviews during and after fieldwork to maintain data consistency and to identify problems. Tetra Tech completed data assessment to fulfill the requirements defined in TT-DE-PMSA-1001, "Quality Assured Data." BJC used the site-specific Oak Ridge Environmental Information System (OREIS) transition tables to print data assessment packages for the Tetra Tech project team. Upon completion of the data assessment process, the Tetra Tech project team provided the BJC Sample Manager with any assessment qualifiers to be input into the site-specific OREIS transition tables.

H.1.5 FIELD QUALITY CONTROL

EPA, DOE, the State of Ohio, and PORTS procedures require that field QC samples be collected to assess data quality. The QC samples collected and analyzed included:

- Equipment rinsates
- Water supply samples (source blanks)
- Trip blanks
- Field blanks
- Duplicate samples

H.1.5.1 Equipment Rinsates

Equipment rinsates were scheduled to be collected at a frequency of 1 in 20 samples. Appendix G provides the data from equipment rinsate samples. A total of two equipment rinsates was collected during the project. Equipment rinsate samples were designated UF00-RBXX samples in Appendix G .

H.1.5.2 Water Supply Samples

A source blank was collected to ensure the quality of the potable water used during drill rig, auger, and spoon decontamination. A fire hydrant (Portsmouth Hydrant No. PL-H3S) located off Martin Avenue southeast of Building X-3346 was used for source potable water during the entire investigation. The field blank sample was collected through a garden hose connected to the poly tank located on the drilling contractor's support vehicle. One field blank was collected and designated UF00-FB01 in Appendix G .

H.1.5.3 Trip Blanks

Trip blanks were collected at a frequency established by the direction of BJC. A total of two trip blanks was collected during the project. Trip blank samples were designated UF00-TBXX samples in Appendix G.

H.1.5.4 Field Blanks

Field blanks were scheduled to be collected at a frequency of 1 in 20 samples. Appendix G provides the data from field blank samples. One field blank (labeled FB01) was collected during the project.

H.1.5.5 Duplicate Samples

Field duplicates were collected and sent to the fixed-base laboratory for analysis. Field duplicates were scheduled to be collected at a frequency of 1 in 20 samples by matrix. Appendix G provides the data from field duplicate samples. A total of six soil field duplicates was collected during the project. Field duplicate samples were designated with a "D" at the end of the sample number in Appendix G .

H.2. GEOTECHNICAL DATA

Tetra Tech collected geotechnical soil samples from three boreholes near Building X-3346 and from three boreholes near the Lithium storage warehouses. Spacing of borings was based on the assumption that uniform, regular soil conditions prevail at the site. Soil samples were collected from the first 22 ft at shallow and deep locations.

The initial boring installed to bedrock was used to compile the depth, thickness, and composition of each stratum to determine depths to collect geotechnical samples at subsequent borings. At the 0-2 ft depth, five 3.5-gal buckets were collected for analysis. Two buckets were collected at the deeper depth. In addition, two Shelby tubes were driven at each geotechnical borehole location. One tube was pushed from the surface to a depth of 30 in. and one was pushed from a deeper interval (the same interval used for collecting the soil cuttings for the pails). The SAP contains a summary of American Society for Testing and Materials analysis methods for each collected sample.